

Serial No. 10/072,907

Docket No.: 1567.1022

REMARKS**INTRODUCTION:**

In accordance with the foregoing, elected claims 1-3 and 39 have been amended, withdrawn claims 29-31 have been amended, and the specification has been amended to correct an apparent typographical error. No new matter is being presented, and approval and entry are respectfully requested as appropriate under 37 CFR 1.116.

On page 2 of the Office Action, the Examiner requires cancellation of withdrawn claims 29-37. However, it is respectfully submitted that withdrawn claims 29-37 have been amended to depend from elected linking claim 1. As noted in MPEP 809.04, "[w]here the requirement for restriction in an application is predicated upon the nonallowability of generic or other type of linking claims, applicant is entitled to retain in the case claims to the nonelected invention or inventions." As such, it is respectfully requested that the withdrawn claims 29-37 be allowed to remain in the instant application as per MPEP 809.

Claims 1-17 and 29-39 are pending and claims 1-17, 38, and 39 are under consideration. Reconsideration is requested.

ENTRY OF AMENDMENT UNDER 37 C.F.R. §1.116:

Applicants request entry of this Rule 116 Response because the amendments do not significantly alter the scope of the claims as compared to at least the previously presented claims, and place the application at least into a better form for purposes of appeal.

The Manual of Patent Examining Procedures sets forth in Section 714.12 that "any amendment that would place the case either in condition for allowance or in better form for appeal may be entered." Moreover, Section 714.13 sets forth that "the Proposed Amendment should be given sufficient consideration to determine whether the claims are in condition for allowance and/or whether the issues on appeal are simplified." The Manual of Patent Examining Procedures further articulates that the reason for any non-entry should be explained expressly in the Advisory Action.

OBJECTIONS TO THE CLAIMS:

In the Office Action at page 2, the Examiner objects to claim 39. Claim 39 has been amended to remove a claim term as requested by the Examiner, and has not been amended to narrow the scope of the claim. As such, reconsideration and withdrawal of the outstanding

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objection to claim 39 is respectfully requested.

REJECTION UNDER 35 U.S.C. §103:**A. Rejection in view of Chu et al. and Gorkovenko et al.**

In the Office Action at pages 2-6, the Examiner rejects claims 1-4, 8-17, 38 and 39 under 35 U.S.C. §103 in view of Chu et al. (U.S. Patent No. 5,523,179) and Gorkovenko et al. (U.S. Patent Publication No. 2003/003360A1). The rejection is respectfully traversed and reconsideration is requested.

On page 6 of the Office Action, the Examiner relies upon Gorkovenko et al. as disclosing the use of cathode electrode materials including a sulfur-containing active material having an interconnected, rigid network having pores of a sub-micron pore size. However, Gorkovenko et al. suggests forming the network using a sol of a non-electroactive material, such as a boehmite sol or a crystalline vanadium oxide sol. Within this sol, the pores are formed so as to generate an interconnected and rigid network. (Paragraph 0108, 0109 of Gorkovenko et al.) However, even assuming arguendo that Gorkovenko et al. suggests pores of submicron size as asserted by the Examiner, there is no suggestion as to the size of the pores in the non-electroactive material being greater than 1 micron.

In contrast, claim 1 recites, among other features, "a material including pores of an average size greater than or equal to 5 μm and less than and including 15 μm having both electron-conductive and ion-conductive properties." Since Chu et al. is not relied upon as disclosing such a feature, it is respectfully submitted that the combination of Chu et al. and Gorkovenko et al. does not disclose or suggest the invention recited in claim 1.

Claims 2-4, 8-17, 38 and 39 are deemed patentable due at least to their depending from claim 10.

Additionally, on page 6 of the Office Action, the Examiner asserts that one of ordinary skill in the art would have been motivated to combine the pores of Gorkovenko et al. with the positive active material of Chu et al. in order to have a sulfur-containing active material having the specified pore size since this results in an interconnected, rigid network. However, the Examiner does not set forth evidence as to where this motivation existed in the prior art, and why the use of an interconnected, rigid network would be otherwise desirable for the use in Chu et al.

As a general matter, in order to establish a prima facie obviousness rejection, the Examiner needs to provide both the existence of individual elements corresponding to the recited limitations, and a motivation to combine the individual elements in order to create the recited invention. Both the individual elements and the motivation need to be shown to have

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existed in the prior art. Should the Examiner fail to provide evidence that either one of the individual elements or the motivation does not exist in the prior art, then the Examiner has not provided sufficient evidence to maintain a prima facie obviousness rejection of the claim. MPEP 2143.03. Thus, the burden is initially on the Examiner to provide evidence as to why one of ordinary skill in the art would have been motivated to combine the individual elements to create the recited invention, and to demonstrate that this evidence existed in the prior art. MPEP 2143.01. Since the Office Action does not indicate a source for the Examiner's motivation, it is respectfully submitted that there is insufficient evidence of record that there existed in the prior art a motivation which would have motivated one of ordinary skill in the art to modify Chu et al. to include the features of Gorkovenko et al. as is required to maintain a prima facie rejection of the claims in view of Chu et al. and Gorkovenko et al.

Further, there is insufficient evidence of record as to why one of ordinary skill in the art would choose the composite cathode described in paragraph 0108 of Gorkovenko et al., which appears to suggest sub-micron pores, as opposed to the alternatives shown in FIGs. 1 through 3 of Gorkovenko et al. and described in paragraph 0105, which use particulates of sulfur containing material of 25 microns or less in different core-shell concepts. As such, it is respectfully submitted there is additionally insufficient evidence as to why one of ordinary skill in the art would have been motivated to choose the sub-micron pores formed in the solid composite electrode described in paragraph 00108 over the larger pores also suggested in other composite electrode as is required to maintain a prima facie rejection of the claims in view of Chu et al. and Gorkovenko et al.

Lastly, as shown in FIGs. 4 and 5 and Tables 1 and 2 of the instant application as set forth in paragraph 0023 and 0024 of the instant application, the applicants found that the size of the pores has a result in an improved retention of liquid phase sulfur to increase utilization. There is no suggestion in Gorkovenko et al. or Chu et al. that the use of submicron pores, as opposed to larger pores, would provide such a result. As such, it is respectfully submitted that there is evidence of record that the recited ranges are of patentable significance such that the recited invention represents a non-obvious improvement over the combination of Chu et al. and Gorkovenko et al.

B. Rejection in view of Chu et al. and Ishida et al.

In the Office Action at pages 6-9, the Examiner rejects claims 1-4, 8-17, 38 and 39 under 35 U.S.C. §103 in view of Chu et al. and Ishida et al. (U.S. Patent No. 4,881,026). The rejection is respectfully traversed and reconsideration is requested.

On page 9 of the Office Action, the Examiner relies upon Ishida et al. as disclosing the use of an NA/S cell having a conductive composite with a pore diameter of between 10 and

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1,000 μm . However, while Ishida et al. appears to briefly summarize a range that includes pores that is greater than 10 μm in an existing Japanese patent publication, Ishida et al. relates to the operation of the Na/S cell in a high temperature (300° to 350°) range, and does not suggest that the pores or the pores in such a range would be useful in other cell technologies, such as a lithium sulfur battery as recited in claim 1. Moreover, it is respectfully submitted that the use of Na instead of Lithium in the cell makes the technologies non-analogous such that one of ordinary skill in the art would not consider the use of the pores disclosed in the Na-S cell of Ishida et al. as providing an advantage in a lithium sulfur battery such as that set forth in Chu et al. Further, there is no suggestion in Ishida et al. that such a range solves a problem present in the lithium-sulfur cells of Chu et al. and which is of a nature that one of ordinary skill in the art would naturally use solutions to similar problems in Na-S cells.

As noted in MPEP 2141.01(a), "[i]n order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." quoting *In re Oetiker*, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). Since there is no indication that the pore sizes suggested in Ishida et al. solves a particular problem, or evidence that such a problem exists in both Na-S and lithium sulfur cells such that the pores in the disclosed range provide a solution applicable to both high-temperature Na-S cells and lithium-cells such as that suggested by Chu et al. As such, it is respectfully submitted that there is insufficient evidence that the lithium cell of Chu et al. is sufficiently analogous to the Na-S cell of Ishida et al. for the purposes of using the suggested pores in Ishida et al. as is required to reject the invention recited in claim 1 under 35 U.S.C. §103 using this combination.

Additionally, it is respectfully submitted that, assuming that Ishida et al. teaches a range from 10 μm , Ishida et al. does not suggest a range including the range recited in at least claim 3. Since Chu et al. is not relied upon as disclosing such a feature, it is respectfully submitted that the combination of Chu et al. and Ishida et al. does not disclose or suggest the invention recited in claim 3.

Further, on page 9 of the Office Action, the Examiner asserts that one of ordinary skill in the art would have been motivated to combine the pores of Ishida et al. with the positive active material of Chu et al. since Ishida et al. discloses known publications including the use of pores, that the specific pore sizes can be used in electrochemical applications, and that Ishida et al. is in the same field of endeavor as Chu et al. and both address and disclose alkali metal-sulfur based batteries and their related technologies. However, the Examiner does not set forth evidence as to where this motivation existed in the prior art, and why the use of the pores, which

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are described without asserting any known benefit and are only described as being used in an Na/S, would be otherwise desirable for the use in Chu et al. As such, the Examiner's assertion appears to be that such pores can exist in the art, without evidence explaining why one of ordinary skill in the art would choose such a pore size at the time of the invention.

In order to establish a prima facie obviousness rejection, the Examiner needs to provide both the existence of individual elements corresponding to the recited limitations, and a motivation to combine the individual elements in order to create the recited invention. Additionally, the motivation must be more than a mere identification that the elements existed in the prior art. As an example, MPEP 2143.01 refers to In re Koltzab, 55 USPQ2d 1313 (Fed. Cir. 2000). In In re Koltzab, the Federal Circuit agreed with the Patent Office and the Examiner that the prior art, as a whole, disclosed each of the individual elements of the recited invention, which was an injection molding machine. However, the Federal Circuit held that "a rejection [for obviousness] cannot be predicated on the mere identification in [one of the prior art references] of individual components of the claimed limitations." Instead, the Federal Circuit held that "particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed." Id. at 1317. As such, in order to establish a prima facie obviousness rejection of a claim, the Examiner needs to both provide this particular evidence of the motivation to make the combination, and show that this evidence existed in the prior art. MPEP 2141.03.

Since the Office Action does not indicate a source for the Examiner's motivation and merely asserts that such elements existed in the prior art, it is respectfully submitted that there is insufficient evidence of record that there existed in the prior art a motivation which would have motivated one of ordinary skill in the art to modify Chu et al. to include the features of Ishida et al. as is required to maintain a prima facie rejection of the claims in view of Chu et al. and Ishida et al.

Lastly, to the extent that Ishida et al. teaches pores, Ishida et al. teaches a broad range of between 10 μm and 1000 μm , and does not suggest an advantage to any of these ranges. As is evident from FIGs. 4 and 5 and Tables 1 and 2 and paragraph 0023 and 0024 of the instant application, the size of the pores has an effect on the capacities and discharge potentials which are not suggested in the prior art. Generally, where evidence exists of record that a recited range imparts a novel feature as compared to the general conditions suggested in the existing art, the rejection cannot be maintained. Specifically and as noted in MPEP 2144.05(III), "[t]he law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must

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show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.' *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990)." Additionally, in making a rejection based on the obviousness of a claimed feature, the Examiner needs to account for evidence in embodiments and experiments set forth in the specification that show the non-obvious nature of the feature. *In Re Glaug*, 62 USPQ2d 1151 (Fed. Cir. 2002). As such, it is respectfully submitted that there is evidence of record that the recited invention represents a non-obvious improvement over the combination of Chu et al. and Ishida et al.

C. Rejection in view of Chu et al. and Cairns et al.

In the Office Action at pages 10-13, the Examiner rejects claims 1-4, 8-17, 38 and 39 under 35 U.S.C. §103 in view of Chu et al. and Cairns et al. (U.S. Patent No. 3,716,409). The rejection is respectfully traversed and reconsideration is requested.

On pages 12-13 of the Office Action, the Examiner relies upon Cairns et al. as disclosing the use of a cathode having a sulfur-containing graphite or sulfur impregnated graphite having an average pore size of 1.4 μm . However, Cairns et al. is not relied upon and does not suggest ranges in excess of 1.4 μm . In contrast, claim 1 recites, among other features, "a material including pores of an average size greater than or equal to 5 μm and less than and including 15 μm having both electron-conductive and ion-conductive properties." Since Chu et al. is not relied upon as disclosing such a feature, it is respectfully submitted that the combination of Chu et al. and Cairns et al. does not disclose or suggest the invention recited in claim 1.

Claims 2, 4, 8-17, 38 and 39 are deemed patentable due at least to their depending from claim 1.

Additionally, on page 13 of the Office Action, the Examiner asserts that one of ordinary skill in the art would have been motivated to combine the pores of Cairns et al. with the positive active material of Chu et al. since Cairns et al. discloses power producing cells containing a cathode structure having such a pore size and which exhibits good cell performance and yields good cell performance while solving the same problem as Chu et al. However, the Examiner does not set forth evidence as to where this motivation existed in the prior art, and why the use of the pores, which are described without asserting any known benefit and are only described as being used in a compound cathode 12 suggested in Cairns et al. would be otherwise desirable for the use in Chu et al.

In order to establish a prima facie obviousness rejection, the Examiner needs to provide both the existence of individual elements corresponding to the recited limitations, and a motivation to combine the individual elements in order to create the recited invention.

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Additionally, the motivation must be more than a mere identification that the elements existed in the prior art. As such, in order to establish a prima facie obviousness rejection of a claim, the Examiner needs to both provide this particular evidence of the motivation to make the combination, and show that this evidence existed in the prior art. MPEP 2141.03.

Since the Office Action does not indicate a source for the Examiner's motivation and merely sets forth that such elements existed in the prior art without evidence as to why a particular combination is made from the multiple set forth in Cairns et al. or why such a compound cathode 12 would be particularly useful instead of the positive electrode disclosed in Chu et al., it is respectfully submitted that there is insufficient evidence of record that there existed in the prior art a motivation which would have motivated one of ordinary skill in the art to modify Chu et al. to include the features of Cairns et al. as is required to maintain a prima facie rejection of the claims in view of Chu et al. and Cairns et al.

Lastly, to the extent that Cairns et al. teaches pores, Cairns et al. teaches a broad range of between 1.4 μm and 90 μm , and does not suggest an advantage to any of these ranges. Specifically, while one set of examples has the plates 34, 38 with pores of 1.4 μm in the context of a graphite material, Cairns et al. teaches that the pore size depends on the material used, and that the preferred sizes for all materials, including graphite, are less than 90 μm . (Table I). Additionally, Cairns et al. does not attribute the benefits as depending on pore size of the plates 34, 38 alone since Cairns et al. teaches the use of electrolyte containing plates 36, 40 having different pore sizes as shown in Table II. (Col. 6, lines 5-21, col. 9, line 62 to col. 10, line 26). Thus, Cairns et al. does not suggest that any benefit is derived solely from the size of the pores in the plates 34, 38, but instead suggests that the pore size of the electrolyte impregnated plates 36, 40 is at least as significant a factor as set forth in the experiments outlined in cols. 10 through 12 such that it is the combination which produces the benefit. As such, Cairns et al. does not suggest a particular pore size for the plates 34, 38, but instead suggests multiple acceptable pore sizes for different plates 34, 36, 38, 40 without distinctly teaching an advantage to having the pore size for the plates 34, 38 be within the recited ranges.

As is evident from paragraphs 0023, 0024, FIGs. 4 and 5 and Tables 1 and 2 of the instant application, the size of the pores has an effect on the capacities and discharge potentials which are not suggested in the prior art. Generally, where evidence exists of record that a recited range imparts a novel feature as compared to the general conditions suggested in the existing art, the rejection cannot be maintained. MPEP 2144.05(III). Additionally, in making a rejection based on the obviousness of a claimed feature, the Examiner needs to account for evidence in embodiments and experiments set forth in the specification that show the non-

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obvious nature of the feature. As such, it is respectfully submitted that there is evidence of record that the recited invention represents a non-obvious improvement over the combination of Chu et al. and Cairns et al.

D. Rejection in view of Chu et al. and Kovalev et al. in view of Cairns et al., Ishida et al., or Gorkovenko et al.

In the Office Action at pages 13-14, the Examiner rejects claims 5-7 under 35 U.S.C. §103 in view of Chu et al. and Kovalev et al. (U.S. Patent No. 6,652,440) in view of Cairns et al., Ishida et al., or Gorkovenko et al. The rejection is respectfully traversed and reconsideration is requested.

The Examiner relies upon Kovalev et al. as disclosing a particle size of elemental sulfur in the range of 0.01 to 100 microns, but not as otherwise curing the above noted defect of the combinations of Chu et al. and Cairns et al., Ishida et al., or Gorkovenko et al. as applied to claim 4, from which claims 5-7, depend. As such, it is respectfully submitted that the combinations of Chu et al. and Kovalev et al. in view of Cairns et al., Ishida et al., or Gorkovenko et al. do not disclose the invention recited in claims 5-7 due at least to the combinations not disclosing the features of claim 4.

Additionally, the Examiner asserts on pages 13-14 of the Office Action that the range of particles from .01 to 100 microns is disclosed in Kovalev et al., and asserts that col. 1, lines 35-53 of Kovalev et al. suggests that elemental sulfur is useful in batteries employing lithium or lithium alloy anodes. By way of review, Kovalev et al. suggests multiple particle sizes for elemental sulfur, including particles from .01 to 100 microns, but Kovalev et al. does not suggest which particle size should be used within this broad range, or which portion of the range is advantageous to use. Importantly, Kovalev et al. does not suggest why the disclosed elemental sulfur is advantageous over other elemental sulfurs, such as that disclosed in Chu et al.

The Examiner asserts on page 15-16 of the Office Action that a prima facie obviousness rejection is maintained since the broad range of .01 to 100 microns described in Kovalev et al. covers the range recited in claims 5-7. The Examiner further asserts that the Examples evidence advantages set forth in the specification do not cover the entire claimed range. However, the Examiner does not provide an explanation as to why one of ordinary skill in the art would use the elemental sulfur suggested in Kovalev et al. as opposed to the active materials set forth, individually, in Chu et al., Cairns et al., Ishida et al., or Gorkovenko et al.

Further, while the Examiner on pages 13-14 of the Office Action asserts that elemental sulfur is suggested in col. 1 of Kovalev et al. as being useful in batteries having lithium and lithium alloy batteries, it is noted that Chu et al. already teaches the use of elemental sulfur in col. 8, lines 33-35 such that it is unclear as to why one of ordinary skill in the art would replace

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Respectfully submitted,

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on 10 OCT, 2004

By: James G. McEwen

Date: 10 OCT 04